The minuter species of Amnicola may sometimes be collected by a process similar to that given above; except that for these one does not plough up the bottom, but strikes the strainer over the bottom or through the weeds. A mixture of species is usually obtained, which may be advantageously sorted with a reading glass.

NOTES ON FOSSIL CALIFORNIAN PLEUROTOMIDAE.*

BY IRA M. BUELL.

The very large collection of fossil forms of this group, made in the Pliocene of Santa Monica, California, by Dr. Rivers, formerly Curator of the Museum of the State University, has afforded the writer opportunity to institute interesting comparisons between forms previously classified under several subgenera of this group. The collection contains over one thousand specimens of these forms, hence the means to test the value of specific distinctions were far more perfect than were apparently present when the species were first described.

Subgenus Borsonia.

Distinguished by plication on columella.

1. *Borsonia hooveri* Arn. Of 27 specimens examined, 16 have faint to obsolete columellar plication. One shows three faint ridges, while the rest lack the subgeneric distinction entirely. All agree in outline and number of whorls with Arnold's type, but about half have almost obsolete nodes on apical whorl like *D. renaudi* Arn., which this approaches.

2. *Borsonia bartschi* Arn. Of 70 specimens studied, 20 show plications faint to obselete in most individuals, one has three, and one has two faint ridges on columella. About half have transverse ribs on the body whorl, and the rest are marked like *D. renaudi*,

* The Rivers Collection of above 100,000 specimens of fossil Californian Mollusca now becomes the property of Beloit College, Beloit, Wisconsin, and Pomona College, Claremont, California, half going to each of these institutions. Numerous important comparative studies have been made while the entire collection is still intact. This great collection indicates one thing with great certainty and that is that the work on the San Pedro and Santa Monica fossil Mollusca will have to be entirely recast. An examination of the material in *Fusus*, *Natica*, and other genera, indicate a condition similar to that described above for certain Pleurotomidæ.

but with fewer whorls. The specimen named by Raymond does not show plication.

3. *Borsonia dalli* Arn. Only four specimens are found under this label. Two show no plication, and the others, though plicate, have one and three more whorls than the type. In this case Arnold's figure does not agree with the description.

4. *Drillia merriami* Arn. Of ten specimens all agree with the author's figure and description in surface markings. Six have the form of *B. bartschii* but differ in the transverse ribs on the body whorl, and one has a plication on the columella. Four slender forms agree with the type, but one has nine whorls and two have plications like *Borsonia*.

5. *Drillia renaudi* Arn. Of 27 specimens examined, 10 agree in form and surface markings with *B. bartschii*. One has columellar fold almost obsolete, 20 agree with the type in the absence of ribs on the body whorl, but have from one to three fewer whorls, while 8 have faint plications on the inner lip.

6. *Drillia pedroana* Arn. Of 20 specimens examined, two broken ones agree with Arnold's figure and description, but the others have from one to three more whorls. Half of these have a distinct sutural band, while the rest approach the next.

7. *Spirotropis smithi* Arn. Of 150 specimens examined, 10 agree in form and surface markings with *D. pedroana* as above noted in the perfect forms. Several have faint spiral lines on the body whorl like the last. One half exceed the type in size, approaching 50 mm.

8. *Pleurotoma perversa* Gabb. About 600 individuals were brought together under this name in the Rivers Collection, and simply because they happened to be sinistral forms. About half are very robust, approaching 60 mm. in length, with broader, more ventricose whorls than the figure and description, but among these are a few which duplicate the dextral *S. smithi*. The smaller forms noted as "young" in the collection are more slender with flattened volutions, and absolutely duplicate, in sinistral form, the dextral types of *D. pedroana*, *B. dalli*, and *B. hooveri*.

These notes lead to rather interesting conclusions:

1. The predominating type in these beds is the sinistral. All of the smooth dextral forms, *B. dalli*, *D. pedroana*, and *S. smithi*, have exact counterparts with reversed coil.

2. This duplication of dextral and sinistral forms minimizes the value of reversal of coil as a specific distinction in this group.

3. The intergradation of supposed specific distinctions in the case of all these described species points to a most chaotic condition in the group, and suggests the need of a reclassification of the group based on broader knowledge and far more extensive material.

NOTES.

Midway-Pernambuco Fauna:—On several occasions I have called attention to the fact that Dr. White's "Cretaceous" fauna published in the Archivos do Museu Nacional do Rio de Janeiro, vol. vii, is a mixture of Midway Eocene and true Cretaceous forms (See Bull. Am. Pal. vol. i, p. 154–157.) Especially have I maintained that the Maria Farinha beds are Eocene. That in eastern Brazil there may be both Cretaceous and Eocene, alike in lithologic appearance and general attitude may well be allowed. But owing to the profound hiatus in our Southern States between the two terranes (though lithologically sometimes similar and formerly supposed to intergrade, Bull. 43, U. S. G. S.) there seemed good reason for supposing that the east Brazilian fossils represent two distinct horizons whose remains had not been carefully discriminated or labeled in the field.

In looking over a box of fossils carefully labeled as to exact horizon from eastern Venezuela a few days ago, I found the typical Midway fauna with the Maria Farinha representatives without the slightest indication of any Cretaceous forms.

The point therefore which I wish to make is this, that, if the Midway as far south as Venezuela shows no trace of Cretaceous forms, it is fair to presume that even somewhat farther south in Brazil the Midway and Cretaceous are still entirely distinct.

Again, this shows quite clearly too that, as we had often maintained, the Midwayan is a tropical, or warm-water fauna, though occurring as far north as west Tennessee. G. D. Harris.

Bermuda Shells. By E. G. Vanatta (Proc. A. N. S., Phila., 1910). Recent specimens of *Kaliella turbinata*, *Vertigo numellata* and *marki*, and *Carychium bermudense* are recorded. These forms were described as fossils in the aeolian limestone. A fresh-water fauna was formerly supposed not to exist in Bermuda, but the following new species are now described and figured. *Physa caliban*, *Planorbis uliginosus*, *P. imus*, *Ancylus bermudensis*, *Pisidium volutabundum* and *Paludestrina bermudensis*. Mr. Vanatta also found fresh-water diatoms. Several other species new to Bermuda are recorded.